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EXAMINER

PICARDAT, KEVIN M

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**BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES**

Paper No. 20040415

Application Number: 09/734,467  
Filing Date: December 11, 2000  
Appellant(s): BEITEL ET AL.

Laurence A. Greenberg  
For Appellant

**EXAMINER'S ANSWER**

This is in response to the appeal brief filed 09 February 2004.

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**(1) *Real Party in Interest***

A statement identifying the real party in interest is contained in the brief.

**(2) *Related Appeals and Interferences***

A statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

**(3) *Status of Claims***

The statement of the status of the claims contained in the brief is correct.

**(4) *Status of Amendments After Final***

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

**(5) *Summary of Invention***

The summary of invention contained in the brief is correct.

**(6) *Issues***

The appellant's statement of the issues in the brief is correct.

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**(7) Grouping of Claims**

The appellant's statement in the brief that certain claims do not stand or fall together is not agreed with because appellant states the patentability of claims 19-23 is separately argued, but then goes on to argue that examiner's rejection of claims 19-23 is simply hindsight reconstruction and that the claims are patentable based on the arguments in regard to claim 1, therefore examiner believes all the appealed claims stand or fall with claim 1.

**(8) Claims Appealed**

The copy of the appealed claims contained in the Appendix to the brief is correct.

**(9) Prior Art of Record**

5,708,302	AZUMA et al.	1-1998
5,952,687	KAWAKUBO et al.	9-1999
5,976,928	KIRLIN et al.	11-1999
6,395,194	RUSSELL et al.	5-2002

**(10) Grounds of Rejection**

The following ground(s) of rejection are applicable to the appealed claims:

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-3, 7, 11-13, 15 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawakubo et al (5,952,687) in view of Azuma et al (5,708,302).

Kawakubo et al teach a method that comprises providing a prestructured substrate 1;

Applying to the prestructured substrate a precious metal 13 to serve as a bottom electrode; and

Polishing the precious metal 13.

See, for example, Figs. 48 to 4D and 6 and accompanying text.

However, Kawakubo et al do not teach that the bottom electrode is formed by applying a precious metal and a donor material and subjecting the layers to a heat treatment.

Azuma et al teaches a method for forming a bottom electrode that comprises forming a Ti or Ta (donor material) layer 34 followed by forming a Pt (precious metal) layer 36; subjecting the layers to heat treatment at a temperature of between approximately 450 °C and approximately 1000 °C (col. 8, lines 37-40), such that the Ti or Ta layer 34 diffuses into the Pt layer and an alloy layer 38 is produced, wherein the thickness of the donor material is selected such that during heat treatment the donor material essentially diffuses completely into the precious metal (col. 5, lines 11-14). See Fig. 1 and accompanying text.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the method disclosed by Kawakubo et al by forming the bottom electrode using the method taught by Azuma et al because a person of ordinary skill in the art at the time the invention was made would have been motivated to use the method taught by Azuma et al in order to form a bottom electrode that adheres well to the underlying layers and does not have short-inducing surface irregularities (see Azuma et al, col. 1 , lines 53-59).

Re claim 17, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to optimize and select an appropriate concentration of the donor material in the alloy layer. The selection of parameters such as energy, power, concentration, temperature, time, depth, thickness, etc., would have been obvious and involve routine optimization which has been held to be within the level of ordinary skill in the art. "Normally, it is to be expected that a change in temperature, or in concentration, or in both, would be an unpatentable modification. Under some circumstances, however, changes such as these may be impart patentability to a process if the particular ranges claimed produce a new and unexpected result which is different in kind and not merely degree from results of prior art...such ranges are termed 'critical ranges' and the applicant has the burden of proving such criticality...More particularly, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation". *In Re Aller* 105 USPQ 233, 235 (CCPA 1955). See also MPEP 2144.05.

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Claims 19-21 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawakubo et al in view of Azuma et al as applied to claims 1-3, 7, 11-13 and 15 above, and further in view of Russell et al (6,395,194).

Kawakubo et al in view of Azuma et al teach a method that comprises forming a precious metal layer and a donor material layer, performing a heat treatment, and performing CMP to form a bottom electrode.

However, Kawakubo et al in view of Azuma et al do not specifically teach the composition of the CMP slurry.

Russell et al teach a CMP slurry for polishing a precious metal layer that comprises water (col. 3, line 7), abrasive particles (col. 4, line 65 through col. 5, line 19), at least one oxidant (col. 5, lines 25-29) and at least one stabilizer (col. 5, lines 28-30), wherein  $Al_2O_3$  particles or  $SiO_2$  particles having a size of approximately 50-300 nm are used as the abrasive.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the method disclosed by Kawakubo et al in view of Azuma et al by using a CMP slurry composition such as that taught by Russell et al because a person of ordinary skill in the art at the time the invention was made would have been motivated to use the slurry taught by Russell et al in order to selectively remove the noble metal layer during CMP (see Russell et al, col. 2, lines 29-33).

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Claims 19, 20 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawakubo et al in view of Azuma et al as applied to claims 1-3, 7, 11-13 and 15 above, and further in view of Kirlin et al (5,976,928).

Kawakubo et al in view of Azuma et al teach a method that comprises forming a precious metal layer and a donor material layer, performing a heat treatment, and performing CMP to form a bottom electrode.

However, Kawakubo et al in view of Azuma et al do not specifically teach the composition of the CMP slurry.

Kirlin et al teach a CMP slurry for use in a capacitor structure that comprises water, Al<sub>2</sub>O<sub>3</sub> or SiO<sub>2</sub> abrasive particles and at least one oxidant, wherein the oxidant is H<sub>2</sub>O<sub>2</sub> (col. 5, lines 16-25).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the method disclosed by Kawakubo et al in view of Azuma et al by using a CMP slurry composition such as that taught by Kirlin et al because a person of ordinary skill in the art at the time the invention was made would have been motivated to use the slurry taught by Kirlin et al in order to effectively remove the metal and dielectric materials that are commonly used in capacitor structures (see Kirlin et al, col. 4, lines 11-22).

**(11) Response to Argument**

Appellant argues that there "is not sufficient motivation for the proposed combination of Azuma and Kawakubo, and is no more than an unsupported



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conclusionary statement based on hindsight and wishful thinking by the Examiner."

Examiner disagrees with this statement since Kawakubo discloses "(w)here the conductive layer made of soft noble metal such as platinum, gold, palladium, rhodium or the like is subjected to mechanical polishing or chemical-mechanical polishing, the layer will undergo so-called "metal flow." The more prominent the metal flow, the less surface smoothness the layer will have. Prominent metal flow, if any, will result in the problem that the bottom electrode and the top electrode of the charge storage element are short-circuited to each other." (see col. 5, line 66 to col. 6, line 7), and Azuma discloses "(t)here remains a need for an effective bottom electrode structure that adheres well and does not have short-inducing surface irregularities." (see col. 1, lines 53-59).

Appellant argues that Kawakubo suggests the problem encountered during structuring precious metal bottom electrodes by disclosing "[m]echanical polishing was used since the barrier layer metal film 12 and the bottom electrode were very thin 100 nm or less..." and "... could be removed by chemical mechanical polishing which scarcely damages the objects being polished". Thus, mechanical and/or CMP of precious metal layers can be carried out only for very thin layers and with the risk of at least some damage to the objects being polished. The examiner believes this argument is incorrect. Kawakubo teaches that "metal flow" causes surface irregularities during CMP and that this is overcome "by using a conductive layer made of a noble metal (including Pt) alloy which has been prepared by adding an appropriate amount of an additive (including Ti) to noble metal" (see col. 6, lines 10-13). Kawakubo is forming a

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bottom electrode which is relatively free of irregularities, and while he may state that CMP will "scarcely" damage the surface he is only stating that the surface will not be perfectly smooth and that an insignificant amount of irregularities may remain. If Appellant believes their claimed process of using CMP leaves behind a perfectly smooth surface the examiner finds this a little hard to believe, since CMP is a method of removing material using an abrasive, at some level there will be irregularities on the surface of even Appellant's bottom electrode.

As to Appellant's argument that Kawakubo does not disclose any problem relating to adherence of the bottom electrode, this was only part of the reason to combine the references. The main reason being that both references teach the need to limit the amount of surface irregularities on the bottom electrode.

Appellant's argument that Kawakubo does warrant or justify the proposed modification by Azuma is moot, since examiner has shown that Kawakubo is concerned about surface irregularities, as stated above, and Azuma addresses the problem.

Examiner believes that the elements of the claimed invention are present in the prior art references and that sufficient motivation to combine the references has been provided.

As for the arguments to the rejection of claims 19-21 and 23 and claims 19, 20 and 22, Appellant does not present any new arguments and basis his claim of allowability on the arguments made with respect to the rejection of claim 1.


Claims 19-23 are related to the slurry used in the CMP process of claim 1 and the references cited (Russell et al. US 6,395,194 and Kirlin et al. US 5,976,928)

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disclose the claimed slurries and teach that they are known in the art. Appellant states that "[t]he present invention solves this problem by introducing an additional donor material and heat treatment that allows for a "conventional CMP", in particular with the aid of conventional, such as already used for structuring non-precious metals" (see page 7, lines 9-13 of the instant specification)" (see page 20, 3<sup>rd</sup> paragraph of the Brief). Therefore, examiner believes that claims 19-23 are related to prior art slurries since one of the reason for the so called invention was to be able to use known prior art slurries, and sees nothing patentable or inventive in the slurries claimed.


For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

  
Kevin M. Picardat  
Primary Examiner  
Art Unit 2822

KMP  
April 15, 2004

Conferees  
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